

## Usability

As I write this chapter, I am at a conference with only my cell phone and keyboard. Although the type is very tiny, I am able to do incredible things that weren't possible many years ago.

When computers were first introduced, only serious hobbyists and those with advanced degrees used them. This is because a person needed to write the code to make it work and many of the applications that we now use daily had not been invented yet. Computers analyzed large data sets, made complex calculations, and kept databases. <[https://en.wikipedia.org/wiki/History\\_of\\_computing\\_hardware](https://en.wikipedia.org/wiki/History_of_computing_hardware)>

Researchers realized the tremendous potential. Computer manufacturers, such as Apple, were pioneers in making computers that anyone could use. The construct of making technology so that people without computer science training can use it is referred to as the usability of a device or system. We like to think of Dr. Don Norman and Dr. Jakob Nielsen along with Alan Cooper as some of the pioneers of usability.

Usability is a construct that encompasses how easy a computer is to use, how easy it is to remember, and how easy it is to learn according to Hornbaek (2006). There are other components that have evolved since the first computers and first usability pioneers started their work. For example, now most people use computers on a tiny screen on their cell phone. Initially, nearly all computers were desktops with large monitors. As computer use has evolved, so has our understanding of usability and difficulty. However, the way that we measure usability has remained the same.

### Measuring usability

Depending on where the product is in the development lifecycle

<[https://en.wikipedia.org/wiki/Product\\_lifecycle](https://en.wikipedia.org/wiki/Product_lifecycle)>, the methodology changes. Usability investigations can begin at the product idea's inception and continue past the product release. Initially, usability was thought to correspond to consumer products. Industrial products, such as medical devices, are also subject to usability studies. There have been cases where consumer or industrial accidents have prompted parties to sue for an un-useable device or a device that encourages injury. An entire organization, Exponent <<https://www.exponent.com/about/about-us>> is based on the idea that usability consultants are needed in litigation cases when organizations fail to conduct proper usability testing.

There is an international organization that sets usability standards for engineered products: ISO or the International Organization for Standards. ISO sets forth definitions and standards for the functionalities of different classes of products. Usability is ISO section: 9241 which is here <<https://www.iso.org/standard/63500.html>>. These standards can be purchased by an organization or found at a library.

Typically, usability is thought of in terms of three constructs: effectiveness, efficiency, and satisfaction. Each product or system should allow the user to attain her intended goal, allow the user to do so in a reasonable amount of time, and the user should be happy with the interaction. Much of the literature in the field of usability also discusses learnability and error recovery. While these are also important, this chapter will focus on effectiveness, efficiency, and satisfaction.

## Development Cycle

Let's discuss a development cycle for a moment. A product begins with someone's idea. The context in which the idea is generated matters a great deal. Here are four different contexts in which an idea happens. 1) Maybe it is during a classroom project that the person has an idea for a better designed pen. 2) Or, it could be an individual at home who likes to tinker and comes up with a better design for a pen. 3) Or, it could be someone who is participating in an entrepreneurial event such as StartUp week develops a superior pen idea. 4) Finally, it could be someone who works for a pen company comes up with a novel design. Here we have four different scenarios as to the likely development path of the idea because of available resources and intellectual property. Intellectual property means who owns the idea and how can it be shared. In the first three cases, the person with the pen idea is not working within a formal organization. The persons in the first three cases would want to be familiar with the laws in their state before sharing the idea. In the first three cases, the person who had the idea would own the idea once they created a recording of the idea (a drawing, a written document, or an audio description). Once the idea is fixed in some format, the idea is automatically copyrighted by the person who fixed it in the format. For example, these readings are copyrighted by myself and Penn State. We own these documents. If someone took these documents and uploaded them to their website, they would be sued by Penn State for intellectual property theft. In some cases, the individual would want to have a non-disclosure agreement or NDA document made by a lawyer to protect the idea as he shared it with others for developing a proof of concept (POC) or minimally viable product (MVP).

The fourth case, where an individual creates an idea within a formal organization, this is the most common. We'll focus on this scenario. Once the idea has been created and can be described verbally, the organization that this person works for owns the idea. These terms are agreed to when the person signs the initial employment paperwork. Any resources used by the person during the idea creation allows the organization to own the idea. While this makes many people uncomfortable initially, it can be one of the best benefits in an organization. This allows the organization to provide resources to develop, promote, and sell the idea. And, it negates the need for an NDA to have others within the organization, such as usability professionals, work on the idea. Once the idea has been formalized and the organization has decided to put resources towards developing the idea, a team is formed. This team typically has a project manager, a marketing person, a usability person and a developer/designer/engineer. Additional personnel may be involved at different stages of the project. Here is a general discussion <<https://www.usability.gov/what-and-why/project-management.html>>

The core team will meet and the usability person will immediately start to find out information about the idea. She will ask key questions of the person who had the idea:

1. Who will use the product or system?
2. What will they use it for?
3. Are there any similar products or systems already in use that do something similar?
4. What frustrations do users have with these current products or systems?
5. What do users like about these current products or systems?
6. Why is this idea a good one?

For each question, she will ask additional questions to find out some core facts:

1. Who are all the users of the product/system- their demographic information, salary range, education level, marketing likes and dislikes. Who are the secondary and tertiary users of the system with their demographics?
2. When does the primary user use the system/product and for what? When do the other users use it or when does it affect them?
3. What are the competitor doing in this market, who are they?
4. What are the frustrations that users have with any of the competitors' products? These are pain points or why we should bother to make this new product/system in the first place.
5. What are the things that users love about current competitors' products? These are opportunities or what we need to emulate and what people value in the current way of doing things.
6. Finding out why we should put company resources toward this idea or why this product idea is great is one of the most difficult to address. Often the usability person will use the Five Whys to find out the core value proposition. The Five Whys is a common technique that is explained further here: <<https://agileleanlife.com/5-whys/>>

Once these questions are answered, the usability person has the basis of developing an experience design strategy. She will obtain the competitor products/systems or gather information on them. She will organize a group of users to meet. As the developers/designers begin working on the functionality of the project/system, the usability person will take the initial specifications and begin to determine additional specifications. Specifications determine what the product/system does and what it does not do. There are several different types of specifications such as user specifications, technical specifications, physical specifications, and so forth.

## Specifications

The FPS can be as simple as a wall full of sticky notes. There are several ways to approach the development of an FPS. Some user experience people prefer to create a task analysis first and then derive the specifications from that. Others prefer a meeting with all of the main stakeholders in the room. Finally, some organizations prefer a room of users to devise the FPS with the UX person as lead. Here are some additional resources: <<https://ux.stackexchange.com/questions/33297/ux-design-technique-using-post-it-notes>>

After the FPS and other specification documents are finished, the team knows what they are building. How they choose to build it is up to the individuals and company culture. Different organizations will try different development approaches according to the types of products they create. Other organizations will use Agile or Lean exclusively. Some may rotate project managers and developers, while others arrange the development teams hierarchically with the most desirable products that require the most expertise available only to the most experienced development teams. Typically, a usability person or UX person will be assigned to a single product for an extended period of time so they get to know the usability problems endemic to that product. The usability person may work with a variety of developers as they cycle through product teams.

After the specifications have been developed and agreed upon by all stakeholders, the UX person will work on the information architecture or experience that the person has when using the product/system. In large organizations, the UX person will work with a visual designer or an interaction designer to produce the first prototypes. They will do this by reviewing what others have done, devising an optimal

flow, then prototyping the flow of one or two main tasks that a user would do with the product using a paper prototype. They may go out to the field (local coffee house) and test the prototype on potential users of the product.

Templates such as the one here <http://ui-patterns.com/> or the ones that are built into the prototyping apps mentioned below help to bring a consistent look and feel to all of the applications that use the same platform or are from the same organization. Different organizations will have their own pattern library. These templates have the standard buttons and menus that users already are accustomed to using.

## User Testing

When the UX person tests the users, she will be asking what they liked and didn't like about the product. Here is an example <<https://www.youtube.com/watch?v=9wQkLthhHKA>> Once she has started to hear the same complaint from two or more participants, she can go back and fix this issue in the prototype. Then, she may test again or add in a few more tasks and then test. This test and retest portion of the development cycle should continue until the UX person has developed the interface enough that it does what it needs to do and no more. That's what is called an MVP or minimally viable product. Once she has accomplished an initial prototype in which the users do not find problems, she can turn it over to the development team. In reality, the process is more complex with lots of discussion of adding and deleting functionality. The user testing never goes as planned. Developers find that what the UX person tested and what the users want is impossible to include. Other complexities happen that intercede and obfuscate the process. Understanding how humans think and act can be critical to helping the process go well on both the development side and the user testing side. Communicating between all parties and understanding all parties unique point of view is critical in UX. Without empathy, a UX person is doomed to creating argument instead of solution.

Work in UX is never complete. Once the product is developed and released to the public, there will be additional problems. Customers will complain about a certain function or they will want additional functionality. Again, the UX designer will prototype, test, and update the FPS according to her testing. Then, she will recommend product improvements or reductions. Sometimes complaints appear that are unique to a certain type of user or a certain type of use.

There are additional tools that the UX professional can use to determine specific types of problems, product/system organization, or improve functionality. Many of those techniques can be found here <<https://www.usabilitybok.org/managing-ux>> Stanton, Salmon, Rafferty and colleagues (2017) have an excellent reference guide on different methods for Human Factors and UX as well.

Usability is intangible, hence an organization will occasionally need for the UX designer to justify the expense of her salary and her worth on the team. The organization will want to know the Return on Investment or ROI of the work. Here is a good article on how to gauge that worth for a particular product <<https://measuringu.com/ux-roi/>> Consistently, organizations find that it is worth the trouble in reduced litigation, increased sales, innovative gains, and fewer customer complaints. <<https://www.experiencedynamics.com/blog/2014/07/making-strong-business-case-roi-ux-infographic>>

Here are some additional links:

<https://www.usability.gov/>

<http://boxesandarrows.com/>

<https://uxmastery.com/resources/books/>

<https://design.google/>

Current prototyping apps

[www.invision.com](http://www.invision.com)

[www.sketch.com](http://www.sketch.com)

[www.axure.com](http://www.axure.com)

[www.figma.com](http://www.figma.com)

## References

Hornbæk, K. (2006). Current practice in measuring usability: Challenges to usability studies and research. *International journal of human-computer studies*, 64(2), 79-102.

Stanton, N. A., Salmon, P. M., Rafferty, L. A., Walker, G. H., Baber, C., & Jenkins, D. P. (2017). *Human factors methods: a practical guide for engineering and design*. CRC Press.